STATE OF CALIFORNIA PETE WILSON, *Governor*

DELTA PROTECTION COMMISSION
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July 10, 1998

To: Delta Protection Commission

From: Lori Clamurro, Delta Protection Commission Staff

Subject: CalFed Ecosystem Restoration Projects in the Delta
(For Commission Information Only)

As part of its Ecosystem Restoration Program, CalFed has been requesting proposals for various studies and projects which would benefit species and their habitats, consistent with the goals and objectives outlined in the Ecosystem Restoration Program Plan. To date, there have been three rounds of solicitations for proposals; the first two have resulted in the selection and funding of projects, and the third was opened in May, with proposals due by July 2. This memo summarizes the 17 projects in the Delta which were approved for funding in the first two rounds.

The following is a list of what types of projects will be occurring in the Delta as a result of the approved CalFed funding. A more complete description of each of these projects and location maps are included in this document.

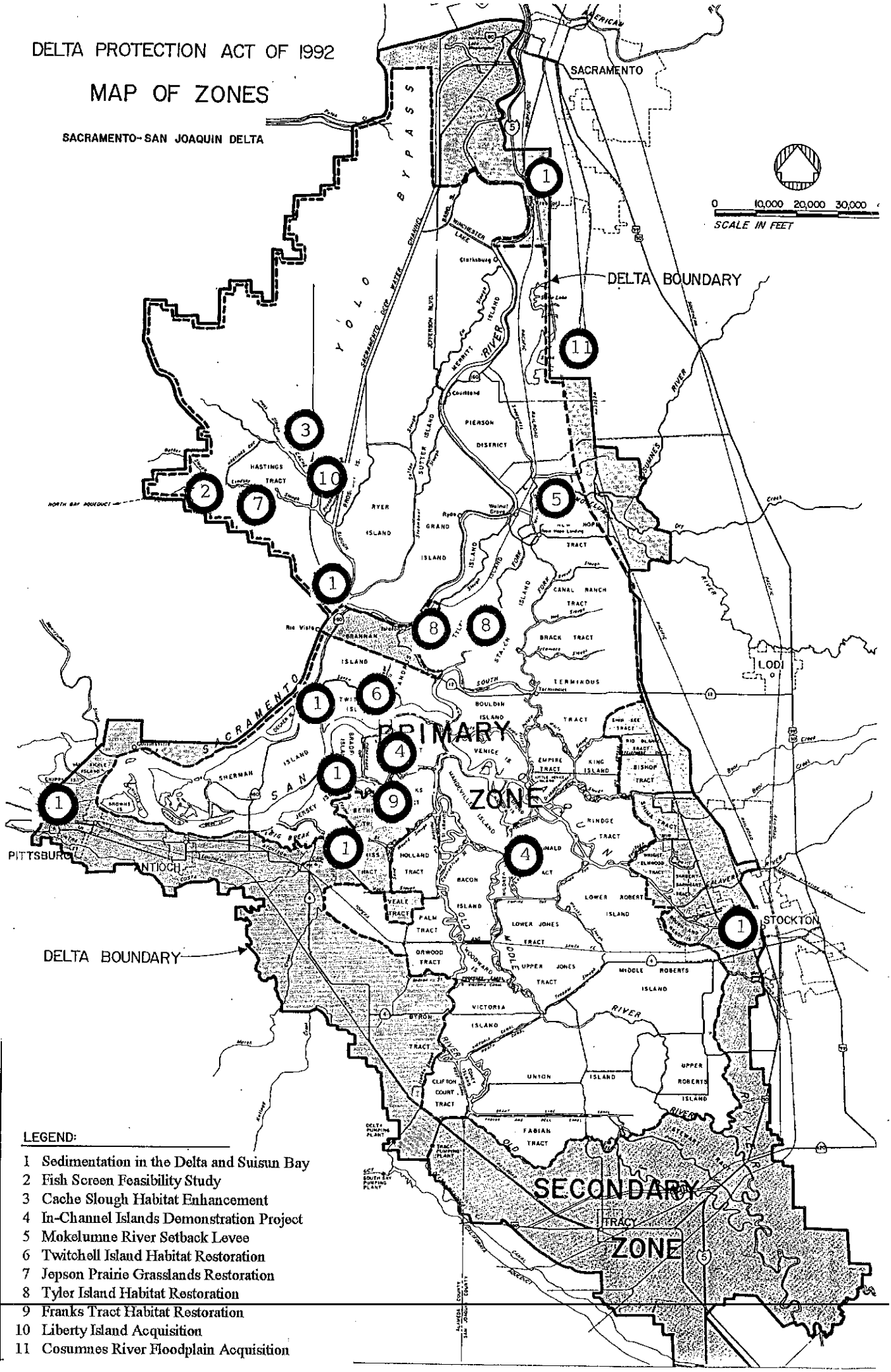
- **Studies (6)**, one in wetlands, and the other five in the water: methyl mercury production from diked wetlands; monitoring contaminants in the water; determining the effect of contaminants on Delta smelt; lab testing of all life stages of smelt; sediment movement and availability; and selenium sampling of rivers and effluents.
- **Planning/Design projects (4)** for future restoration work: a fish screen feasibility study on Hastings Tract along Cache Slough; a habitat enhancement study on Hastings Tract along Cache Slough; in-channel islands at Little Tinsley and Webb Tract; and a setback levee on McCormack-Williamson Tract along the Mokelumne River.
- **Restoration/Enhancement projects (5)**: reversing subsidence on Twitchell Island; restoring grasslands at Jepson Prairie Preserve; creating riparian habitat on Tyler Island along Georgiana Slough and the North Fork of the Mokelumne River; constructing islands on Franks Tract; and repairing the levees on Prospect Island.
- **Acquisitions (2)**: Liberty Island and properties contiguous to the Cosumnes River Preserve

Out of a total of approximately $80,000,000 in grants for 1997 and 1998, $25,406,240 has been designated for projects in the Delta.

DELTA PROTECTION ACT OF 1992

MAP OF ZONES

SACRAMENTO-SAN JOAQUIN DELTA



LEGEND:

1 Sedimentation in the Delta and Suisun Bay
2 Fish Screen Feasibility Study
3 Cache Slough Habitat Enhancement
4 In-Channel Islands Demonstration Project
5 Mokelumne River Setback Levee
6 Twitchell Island Habitat Restoration
7 Jepson Prairie Grasslands Restoration
8 Tyler Island Habitat Restoration
9 Franks Tract Habitat Restoration
10 Liberty Island Acquisition
11 Cosumnes River Floodplain Acquisition

CALFED ECOSYSTEM RESTORATION PROJECTS FOR 1997 AND 1998

Effects of Wetland Restoration on the Production of Methyl Mercury in the San Francisco Bay-Delta System (D274)

No site map available

Newly flooded wetlands are known to produce significantly elevated concentrations of toxic methyl mercury, even when initial mercury levels are relatively low. In California, the threat from methyl mercury is compounded by the legacy of mining-related mercury contamination across wide areas of the state; because of the widespread nature of this contamination, virtually every subregion of the Bay-Delta and its watershed is affected. Because a number of restoration projects involve the deliberate breaching of existing levees, there is concern that mercury will further impact the Delta's ecological health. UC Davis (the applicant) proposes to:

- Produce an inventory of previously reflooded wetlands (locations of reflooded wetlands in the Delta have not yet been determined);
- Document a restoration history from these sites;
- Verify and ground truth site characteristics;
- Obtain a long-term sedimentological history of mercury deposition at a selected number of sites along a chronological sequence;
- Determine the potential for production of methyl mercury for specific sites along this chronological gradient; and
- Provide recommendations for restoration plans involving re-flooding of existing diked lands.

This project will yield baseline data quantifying the levels of methyl mercury production from diked wetlands and reflooded wetlands; this data is essential for establishing a monitoring program to evaluate predicted levels of methyl mercury produced from future restoration projects. The proposal meets the goals of the ERPP as it should help to reduce loading, concentration, and bioaccumulation of contaminants of concern to ecosystem health in water, sediments, and tissues of fish and wildlife. *Further information:* ***Thomas Suchanek*** *of UC Davis at* ***(530) 752-9035.***

STATUS: The applicant was awarded $546,171 to complete this project. CALFED staff is reviewing the revised scope of the project.

Pilot Study: Delta Toxicity Monitoring Project (D264)

No site map available

The DeltaKeeper will conduct a one-year pilot study to establish baseline toxicity data at 12-14 sites throughout the Delta and east-side tributaries, and complement similar efforts by others (the Sacramento River Watershed Project and the San Francisco Estuary Institute). This project is designed to initiate DeltaKeeper's proposed Full Toxicity Monitoring Project proposal. In addition to providing data on specific toxicants that impact overall waterway and ecosystem health, the pilot project will provide important information useful in strategy development and implementation of DeltaKeeper's on-the-water boat patrol and toxic discharge education programs. The work plan for this project consists of:

- Project development;
- Operation of the DeltaKeeper boats to gather water samples;

- Analysis (performed by the UC Davis Aquatic Toxicology Laboratory);
- Hiring of technical consultants;
- Volunteer coordination; and
- Data interpretation.

Although the applicant has a general idea of the sites which will be tested (e.g., Vernalis pumping plant, the Sacramento River at Hood, Prospect Slough, White Slough), specific locations along some of these waterways have not yet been determined. In addition to the baseline toxicity data which will be collected, second-stage studies will be conducted throughout the Delta, and Toxic Identification Evaluations documenting the specific contaminants present will be produced. DeltaKeeper will evaluate the project on a quarterly basis and conduct a full evaluation at the end of the study.

The proposal will eventually help to reduce loading, concentration, and bioaccumulation of contaminants of concern to ecosystem health in water, sediments, and tissues of fish and wildlife. *Further information:* ***Bill Jennings*** *of DeltaKeeper at* ***(209) 464-5090.***

STATUS: $100,000 in funding has been approved by the CALFED agencies for the baseline water quality monitoring; the applicant has also received a $20,000 grant from U.S. EPA. Staff is waiting for the revised scope.

Role of Contaminants in the Decline of Delta Smelt in the Sacramento-San Joaquin Estuary (E6)

No site map available

Despite intensive monitoring of Delta smelt distribution and abundance, little is known about the factors regulating their population. Although water diversions, exotic species, habitat loss and habitat degradation are thought to affect the population, there is an increasing concern that contaminants from commercial, domestic, and agricultural sources may also be a factor. This study will evaluate the effect of contaminants on delta smelt by quantifying the overall health, condition, and growth rate of Delta smelt collected from various sites. The contaminants which will be evaluated have not yet been determined. In the first year of the project, UC Davis proposes to:

- Examine the 1996 year-class failure, using samples archived by DFG surveys to determine whether sublethal tissue or genetic alterations due to contaminant exposure affected growth rates;
- Coordinate field sampling with existing programs (DFG, USBR, USGS); and
- Conduct growth experiments with commonly detected chemicals.

In the second year, UC Davis will:

- Examine whether growth rate varies as a function of outflow, habitat conditions, and contaminant loading; and
- Continue with sampling, exposure, and growth studies.

Budget costs for Year 1 are $224,704; costs for Year 2 are $212,622. *Further information:* ***Dr. William Bennett,*** *Bodega Marine Laboratory, at* ***(707) 875-2035.***

STATUS: $437,000 in funding has been approved by the CALFED agencies (no cost share proposed). CALFED staff is currently waiting for the revised scope of the project.

Culture of Delta Smelt at Delta Site, in Support of Environmental Studies and Restoration
No site map available

UC Davis proposes to establish a functional culture system for the threatened Delta smelt. The development of a reliable and technically feasible culture system will support ongoing environmental projects by providing all life stages of smelt for laboratory research; material and data from this testing can be used as test-standards in ongoing projects of Delta smelt habitat improvement. The applicant will design and operate, and optimize the methodologies of culture at two small culture facilities in Byron: the State Water Project Fish Facility and the Fish Rearing Facility at the Federal Station. The culture program will follow five basic steps: the procurement of wild juveniles, rearing them to spawning age in flow-through tanks, hatching embryos in jars, rearing larvae to post-larval stage on cultured rotifers, and rearing post larvae to full metamorphosis on natural and cultured zooplankton.

UC Davis has broken the three-year project into three one-year stages; the first of these stages has been approved for CALFED funding. The tasks included under Year 1 of the project are:

- Installation of a rearing system for the broodstock and culture unit for phytoplankton and rotifers at the Federal Station;
- Rearing and spawning brood fish at both sites;
- Optimization of larvae culture (through the use of phytoplankton); and
- Rearing wild post-larval stages of Delta smelt trapped at the State and Federal Fish Collection Facilities (pumps).

This project will support ongoing studies on fish screen design, environmental physiology, eco-toxicology, and habitat improvement by providing smelt embryos, larvae, juveniles, and adults for laboratory testing. *Further information:* ***Prof. Serge Doroshov****, UC Davis, at* ***(530) 752-7603.***
STATUS: $194,870 has been approved by the CALFED agencies for the first year of this project. Staff is currently waiting for the revised scope.

Assessing Impacts of Selenium On Restoration of the San Francisco Bay-Delta Ecosystem (B103)
No site map available

Selenium has been implicated in numerous cases of reproductive failure and loss of fish, waterfowl, and crustacean populations. Restoration of the Bay-Delta could be ineffective without resolution of selenium-related issues. USGS proposes to conduct a three-year study evaluating selenium in the Bay-Delta to develop models useful for selenium management. This study will deliver the following products:

- A quantitative description of how the rivers, agricultural drainage, refineries, and recycling of sediments contribute to selenium concentrations in the Bay-Delta;
- Determination of how changing sources might affect selenium tissue concentrations in primary consumers under different river inflow regimes;
- Linkage of selenium concentrations in primary consumers to uptake by predators and inferences about the potential for adverse effects on sturgeon, diving ducks, striped bass, and Delta smelt;

- A direct determination of whether selenium affects reproduction and development in sturgeon;
- Models, developed from the above information, that can forecast the outcomes of alternative selenium remediation/restoration strategies or can evaluate the status of selenium issues; and
- A baseline of monitoring data against which future changes in selenium contamination can be evaluated.

Rivers and effluents will be sampled monthly to determine selenium inputs. Although it is known that sampling will occur at Freeport, Vernalis, and in New York Slough (south of Browns and Winter Islands), specific locations have not yet been determined.

The applicant proposes to work with CALFED to resolve knowledge gaps and use models and monitoring to aid management of selenium controversies that might impede the restoration process. *Further information:* ***Sam Luoma,*** *USGS, at* ***(650) 853-8300.***

STATUS: The full requested amount of $1,588,709 has been approved by CALFED agencies for the three-year study. A contract for $517,000 was executed on 3/6/98; a contract for $883,000 was sent to the applicant for signature on 5/7/98.

Sedimentation in the Delta and Suisun Bay (D283)

Site map on pg. 10

The primary objective of this study is to describe the movement of the sediment needed for habitat restoration. Sediment is a raw material needed for restoration of elevation of habitats, and knowledge of its movement will guide the improved future design of ecosystem restoration projects. USGS will monitor sediment transport at several sites and evaluate suspended load (sediments moving at the same speed as water) and bedload (sand moving at a slower rate along the bed). Data will be analyzed to determine the variations in sediment transport that occur with seasonal changes in the watershed, flow magnitude, tidal cycles, and local fluctuations in sediment supply. *Further information:* ***Dr. David Schoelhamer,*** *USGS, at* ***(916) 278-3126.***

STATUS: The total funding for this project will be $1,046,200. A contract for $587,000 was executed 3/16/98; the contract for $460,000 was executed 5/21/98.

Fish Screen Feasibility Study (Phase 1) - Hastings Tract (A314)

Site map on pg. 11

Cache Slough is within the "critical habitat area" for Delta smelt designated by the USFWS. In order to reduce the entrainment of Delta smelt and other fish species, Hastings Island Land Company proposes to install fish screens on its gravity intake pipes and relocate the pipes from Cache Slough to Lindsey Slough. This proposal involves completing a feasibility report for the fish screens and relocation; this report would consist of a technical study and a biological study. If the project is found to be feasible, then funding for construction would be requested at a later date. *Further information:* ***Gil Cosio,*** *Murray, Burns, and Kienlen, at* ***(916) 456-4400.***

STATUS: The full requested amount of $27,000 has been approved by the CALFED agencies (no cost share proposed) for the study. The contract is currently being negotiated.

Cache Slough Shaded Riverine Aquatic Habitat Enhancement Project (M315)
Site map on pg. 12

Reclamation District No. 2060, Hastings Tract, proposes to restore approximately 2,000 lineal feet of its levee bank where erosion has removed shaded riverine aquatic habitat, leaving a bankline void of vegetation and containing erosion pockets creating scallops. The applicant plans to place fill to restore the bankline to its pre-erosion condition, stabilize this fill with rock riprap, fill the riprap voids with soil material, cover the bank with coconut fiber mats, and plant grasses and sedges to revegetate the bankline and re-create the lost habitat. Phase I of this project, the planning and design phase, involves the following tasks:

- Engineering, surveys and mapping;
- Biological surveys of pre-project conditions;
- Engineering and biological design;
- Regulatory permitting and CEQA/NEPA documentation; and
- Final engineering design and compilation of contract plans and specifications.

This project will benefit priority habitats (shaded riverine aquatic, instream cover, and tidal perennial aquatic), thus benefiting target priority species including Delta smelt and anadromous fishes. *Further information:* ***Gil Cosio, Murray, Burns, and Kienlen, at (916) 456-4400.***

STATUS: $85,000 has been approved by CALFED agencies for the completion of Phase I. The contract was executed 6/2/98.

Demonstration Project for Protection and Enhancement of In-Channel Islands (K185)
Site maps on pg. 13-14

The Association of Bay Area Governments is the applicant for the Delta In-Channel Island work group's demonstration project. The work group includes several state and federal agencies and other interested parties. The goal of the project is to preserve and restore Delta in-channel islands and associated habitats by designing and constructing several small restoration areas (e.g., Little Tinsley Island, Webb Tract Islands), demonstrating and evaluating a variety of biotechnical techniques (as opposed to overuse of "hard" materials) in order to accomplish restoration objectives, and producing a handbook which can guide future in-channel island restoration throughout the Delta.

The funding approved by CALFED is for the organizational tasks, project design, environmental review, and permitting tasks listed in Phases I and II. The work products that can be expected from the funded portion of the project are final plans and specs for construction, environmental documentation, and required permits.

The proposal meets the goals of the ERPP as it should help to maintain existing channel islands and restore 50 to 200 acres of high-value islands in selected sloughs and channels in each Delta ecological unit. *Further information:* ***Marcia Brockbank, San Francisco Estuary Project, at (510) 286-0780.***

STATUS: $270,270 in funding has been approved by the CALFED agencies. The work group will contribute $91,000 in direct costs and in-kind services. Staff has received the revised scope of the project.

Mokelumne River Setback Levee and Habitat Enhancement Project (H304)
Site map on pg. 15

Reclamation District No. 2110 proposes to construct a 3.4 mile long levee which is set back approximately 400 feet from an existing levee along the right bank of the Mokelumne River, one mile downstream of its confluence with the Cosumnes River. A new channel will be constructed between the existing channel and the proposed levee to provide additional flow capacity for the river. The existing levee will be left in place as habitat. This project is the upstream component of the preferred alternative identified in the draft EIR/EIS for the North Delta Program (Nov. 1990). The funding approved by CALFED covers Phase I, which includes pre-evaluation of the project and design, environmental review and permitting, and monitoring and evaluation.

The project would restore a minimum of 1,240 acres of self-sustaining or managed diverse, natural riparian habitat along the Cosumnes River, restore or plant riparian/riverine aquatic habitat and recreate slough habitat and setback levees. *Further information:* ***Gil Cosio, Murray, Burns, and Kienlen, at (916) 456-4400.***

STATUS: $365,000 in funding has been approved by CALFED agencies. **NOTE: This project is on hold as the Nature Conservancy negotiates to buy McCormack-Williamson Tract** ***(see "Cosumnes River Floodplain Acquisitions & Management", p. 9).***

A Learning Laboratory for Restoring Subsided Lands in the Delta: Phase 1 (Twitchell Island Restoration) (K250)
Site maps on pg. 16-17

The applicant for this project is an interdisciplinary team comprised of DWR and USGS scientists and engineers, Northwest Hydraulic Consultants, Inc., Natural Heritage Institute, Philip Williams and Associates Ltd., and Steve Deverel, Ph.D. The goal of the project is to develop technical design recommendations for a broader, long-range, cost-effective, and environmentally sound Delta island restoration program to raise the surface elevation of subsided islands. This proposal addresses Phase I of the project; the applicant seeks immediate funding to design and construct three large restoration pilot projects totaling 600 acres on Twitchell Island. The applicant proposes to complete the following tasks in Phase I:

- Pre-construction research and data collection on Twitchell Island;
- Comply with CEQA requirements and obtain permitting;
- Analysis and design project components;
- Construct Twitchell Island restoration pilot projects; and
- Document results and distribute program reports.

This proposal will create target habitats as well as provide information necessary for broad scale restoration of these targets, develop subsidence reversal technology, and identify information and procedures necessary to simultaneously restore tidal perennial aquatic habitat and protect water quality for beneficial uses. *Further information:* ***Curt Schmutte, Department of Water Resources, at (916) 227-7567.***

STATUS: $3,583,000 has been approved by CALFED agencies. The scope has been received.

Restoring Ecosystem Integrity in the Northwest Delta (Jepson Prairie Restoration (K109))
Site map on pg. 18

Solano County Farmlands and Open Space Foundation proposed a three-year, three-component program along two northwest Delta sloughs and adjacent perennial grasslands at Jepson Prairie. The applicant proposes to:

- Restore shaded riverine aquatic habitat along two Delta sloughs (one mile of shaded riverine aquatic habitat along portions of Barker Slough and Calhoun Cut at the Jepson Prairie Preserve);
- Restore perennial grasslands at Jepson Prairie, located adjacent to seasonal wetlands, floodplain, and vernal pools by controlling invasive exotic weed species and enhancing native plant composition; and
- Design a habitat corridor connecting Jepson Prairie to Prospect Island. The applicant will prepare a Site Conservation/Restoration Plan for a continuous shaded riverine aquatic and wetland corridor between the Jepson Prairie Preserve and Prospect Island; the plan will identify potential wetland restoration sites and an assessment of threats and opportunities.

*Further information: **Ken Poerner**, Solano County Farmlands and Open Space Foundation, at **(707) 428-7580**.*

STATUS: $244,801 in funding was approved by the CALFED agencies. The applicant will jointly fund the cost of the project coordinator and will also provide volunteer labor. Staff is waiting for the revised scope.

Tyler Island Levee Protection and Habitat Restoration Plan (K38)
Site map on pg. 19

Habitat Assessment & Restoration Team, Inc. has outlined three goals for this project: use biotechnical bank and levee methods to protect and enhance natural earthen banks and reveted sites; create desirable shaded riverine aquatic habitat, instream cover, and tidal perennial aquatic habitat; and complete a monitoring program for comparisons of the effectiveness of the different restoration strategies on erosion control, plant survival and growth, habitat quality, and water quality. Some of the methods include the use of ballast buckets, coir biologs, and coir mats; these will be installed along various reaches of levees under the jurisdiction of Reclamation District 563. Although specific locations are not yet known, it is anticipated that within the bottom two-thirds of Tyler Island, approximately 2,000 feet of habitat will be protected/enhanced along Georgiana Slough and 3,000 linear feet will be created/enhanced along the North Fork of the Mokelumne River.

The proposal meets the goals of the ERPP as it should help to restore five to ten miles of riparian and riverine habitats along the Mokelumne River and restore 1,000 acres of shallow-water habitat. *Further information: **Dr. Jeffery Hart**, President of Habitat Assessment & Restoration Team, Inc., at **(916) 451-6679**.*

STATUS: $885,202 has been approved by CALFED agencies; the project does not include cost-sharing. The contract should be signed by mid-July.

Franks Tract State Recreation Area Wetlands Habitat Restoration (K216)
Site map on pg. 20

This is a proposal to create desirable habitat at Franks Tract State Recreation Area, which consists of two flooded Delta tracts. In 1990, Deptartment of Parks and Recreation (DPR) contracted with Moffat & Nichol Engineers to determine the feasibility of constructing a number of islands to bolster the fish and wildlife resources at Franks Tract, serve as effective wave barriers for neighboring levees, and expand the recreational land area. The study recommended the construction of four demonstration islands along Piper Slough. This proposal implements the recommendations contained in the Moffat & Nichol report. Funding has been approved for Phase I of the project: completion of the CEQA/NEPA environmental review and permit process and preparation of the Final Design and Construction Documents. The proposed schedule allows one year for the completion of this phase. When fully implemented, the project will restore 45 acres of existing deeply flooded habitat to a combination of tidal perennial aquatic habitat, shaded riverine aquatic habitat, and mid-channel islands and shoal habitat; in addition, levees will be protected from wave action.

The overall project will restore riparian/riverine aquatic habitat and recreate slough habitat and setback levees, restore 500 acres of shoals in the westernmost portion of the Central and West Delta, and maintain existing channel islands and restore 50 to 200 acres of high value islands in selected sloughs and channels in each Delta ecological unit. *Further information:* ***Richard Rhoads****, Moffatt & Nichol Engineers, at* ***(530) 944-5411.***

STATUS: $231,500 in funding has been approved by CALFED agencies for the joint proposal among Moffat & Nichol Engineers, DPR, and DWR. Cost sharing includes the $350,000 previously spent by DPR for the planning and preliminary engineering, and approximately $20,000 of in-kind services to be contributed by DWR. Staff has received the revised scope for this project.

Prospect Island Levee Repair
No site map available

Prospect Island is the site for the proposed Prospect Island Habitat Restoration Project, cosponsored by the Army Corps of Engineers and DWR on lands owned by the Bureau of Reclamation. The applicants have requested Category III funding to repair the levees on Prospect Island to drain the flooded island, and then carry out the fish and wildlife habitat restoration project. They have identified a need to fix these levees this summer and fall to prevent further erosion to the internal structure of Prospect Island levees and to meet the work "windows" designated to protect Delta smelt.

The Port of Sacramento owns approximately 300 acres of land adjacent to and south of the proposed habitat restoration project. Since 1995, flood flows in the Delta have repeatedly breached levees and flooded the project site, as well as the Port's land; these levees must be repaired before any construction of the restoration project can proceed. $2 million in funding is being requested to close a breach on the cross levee separating the project site from the Port lands, a breach on an exterior Miner Slough levee on the Port's land, and to pump Prospect Island dry.

STATUS: This proposal is being reviewed outside of the normal solicitation process. The request was recently brought to CALFED management and various workgroups, including the Ecosystem Round Table. No final decision on the level of funding has been made.

Liberty Island Acquisition (K207)

Site map on pg. 21

The applicant is USFWS. The applicant proposes to acquire 4,760-acre Liberty Island from a single willing seller. The site provides potential wetlands and shaded riverine aquatic habitat for winter-run salmon, Delta smelt, splittail, and other species. Restoration efforts are under study at neighboring Prospect Island and Little Holland Tract. Restoration funding for Liberty Island was not requested as part of the proposal; only for acquisition. An environmental document will have to be written and circulated by USFWS before the purchase of the land can occur.

Once Liberty Island has been purchased, the restoration project will restore 1,000 acres of shallow-water habitat. *Further information:* ***John Castellano, USFWS, at (916) 979-2085.***

STATUS: $8,577,000 in funding was approved by CALFED agencies for acquisition; the contract for this project was executed 3/11/98.

Cosumnes River Floodplain Acquisitions and Management (H37)

Site map on pg. 22

The primary objectives of this proposal are to: protect existing riparian, wetland, and aquatic habitats and associated species; reestablish riparian, wetland, and aquatic habitats through restoration of natural processes and expansion of the floodplain; and facilitate population expansion of species associated with the Cosumnes (fall-run salmon, splittail, sandhill cranes, neotropical migrant bird species, and waterfowl). The Nature Conservancy and the Wildlife Conservation Board (the applicants) propose to acquire fee or easement interests from willing sellers on three properties that are contiguous to the Cosumnes River Preserve, have high habitat values, and/or offer conservation managers excellent opportunities to expand the floodway and restore the riparian corridor of the lower Cosumnes River. CALFED funding will allow the applicants to complete the purchase of 2,915 acres which are presently under option or require permanent financing. In addition, the funds will allow for start-up restoration, stewardship, and operation and maintenance activities on these properties as they are acquired.

The projects will restore a minimum of 1,240 acres of self-sustaining or managed diverse, natural riparian habitat along the Cosumnes River. *Further information:* ***Valerie Calegari,*** *Nature Conservancy, at* ***(916) 683-1703.***

STATUS: $6,975,100 in funding has been approved by CALFED agencies. The acquisition portion of this grant was moved to federal funds (US Bureau of Reclamation, in the amount of $3,400,000) on 6/8/98. Staff is waiting for the revised scope.

Figure 1. -- Study area

Hastings Island Land Company
MURRAY, BURNS & KIENLEN - Consulting Civil Engineers
1416 29th Street Ste 300, Sacramento CA 95816 - (916) 456-4400
SHEET 2 OF 2
EXISTING PUMP INTAKE
PUMP STATION
PROPOSED PUMP INTAKE
CACHE SLOUGH
HASTINGS TRACT
LINDSEY SLOUGH
LIBERTY ISLAND
PROSPECT SLOUGH
SHAG SLOUGH
Cache Slough
Peters Pocket
Hastings Cut
Lindsey Slough
Scale in Feet
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2000
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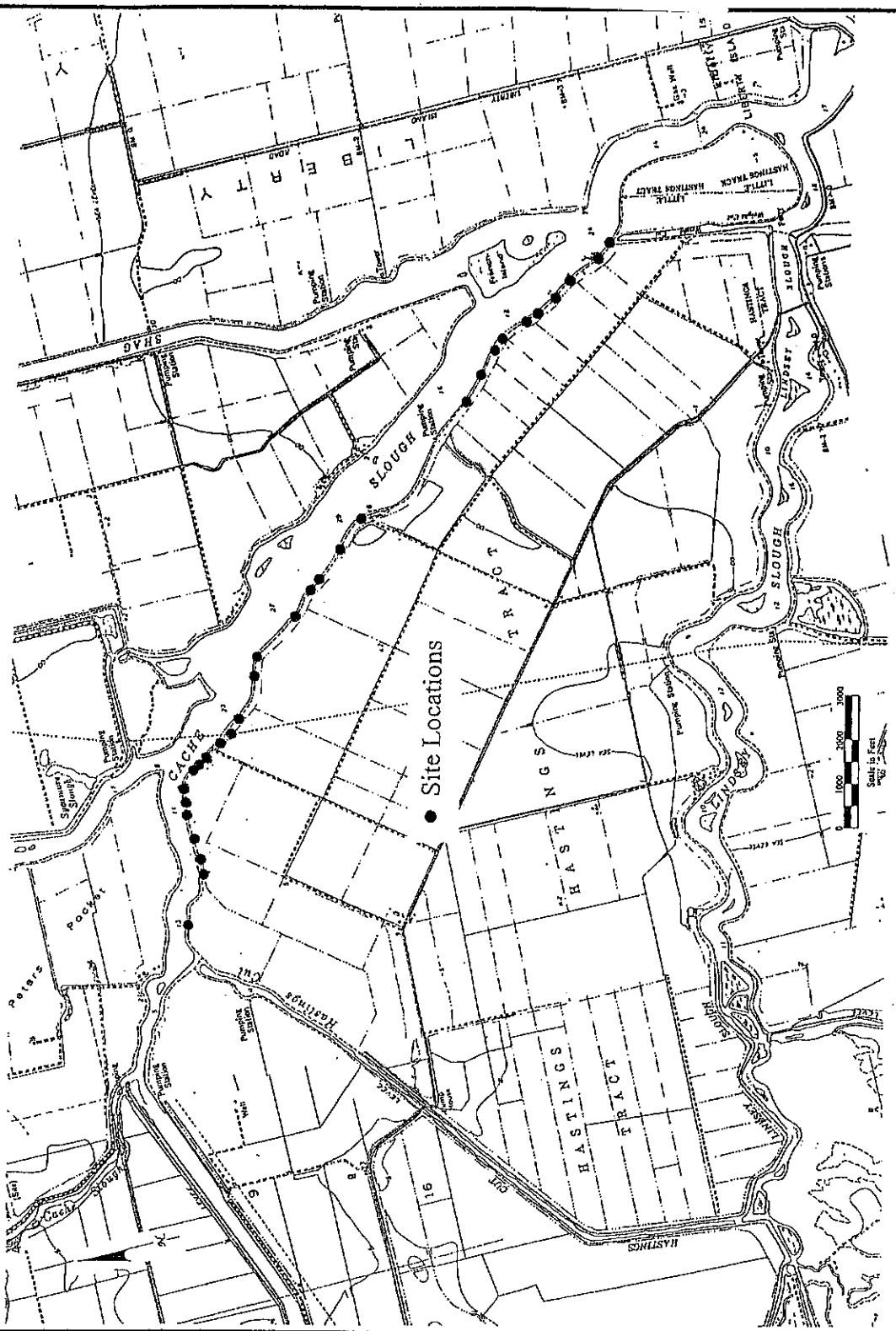
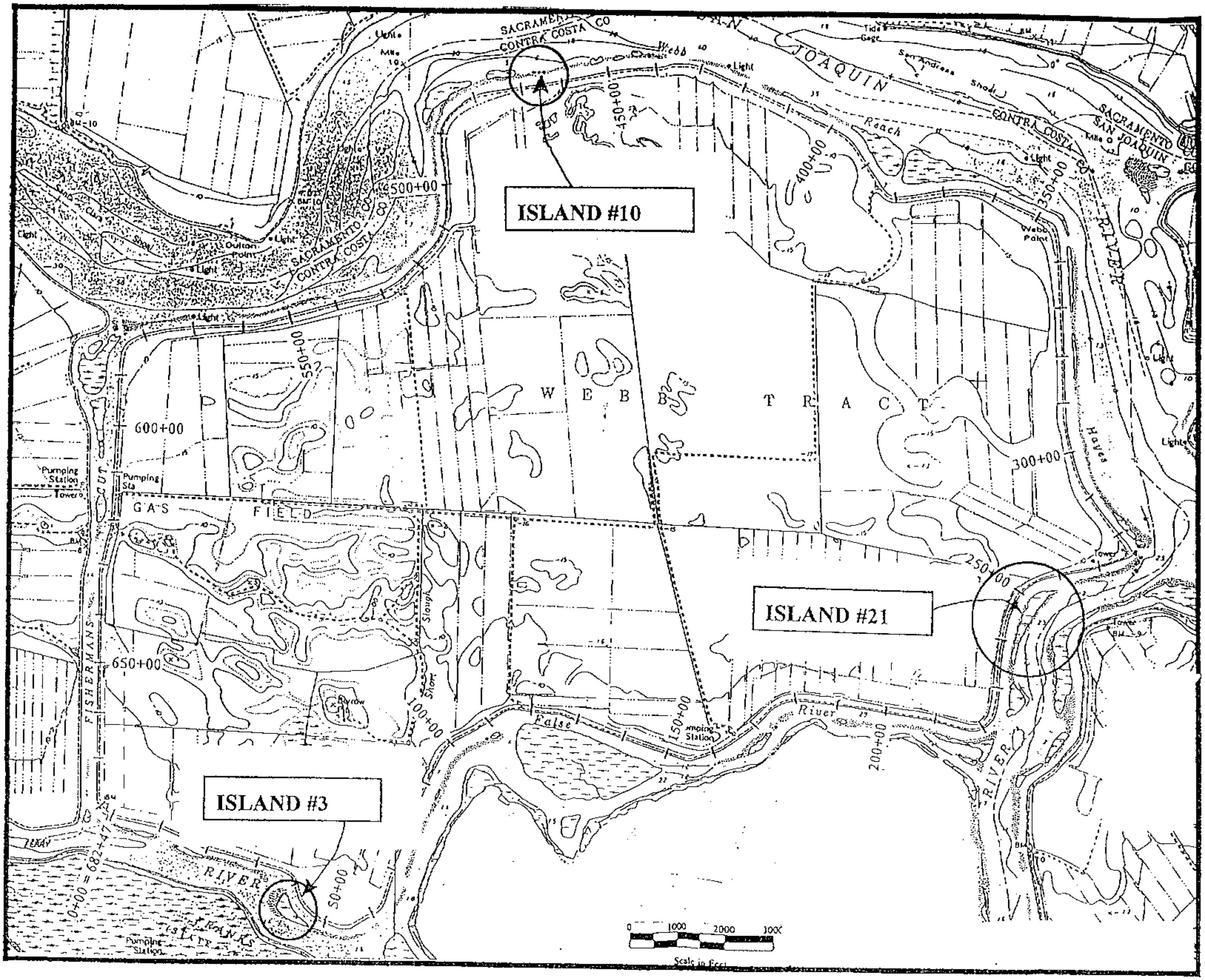


Erosion Site Map Hastings Tract Cache Slough	APPLICANT: Reclamation District No. 2060 Hastings Tract c/o Henry N. Kuechler, III 1143 Crane Street, Suite 200 Menlo Park, California 94025	Cache Slough Shaded Riverine Aquatic Habitat Enhancement Project DATUM: NGVD COUNTY: Solano
Murray Burns and Kienlen - Consulting Civil Engineers 1010 29th Street Ste 300, Sacramento CA 95816 - (916) 456-4400	Date: July 1997	Figure 2


ISLAND #10
ISLAND #21
ISLAND #3
W E B B T R A C T
SAN JOAQUIN
SACRAMENTO
CONTRA COSTA
GAS FIELD
FISHERMANS CUT
False River
Pumping Station
500+00
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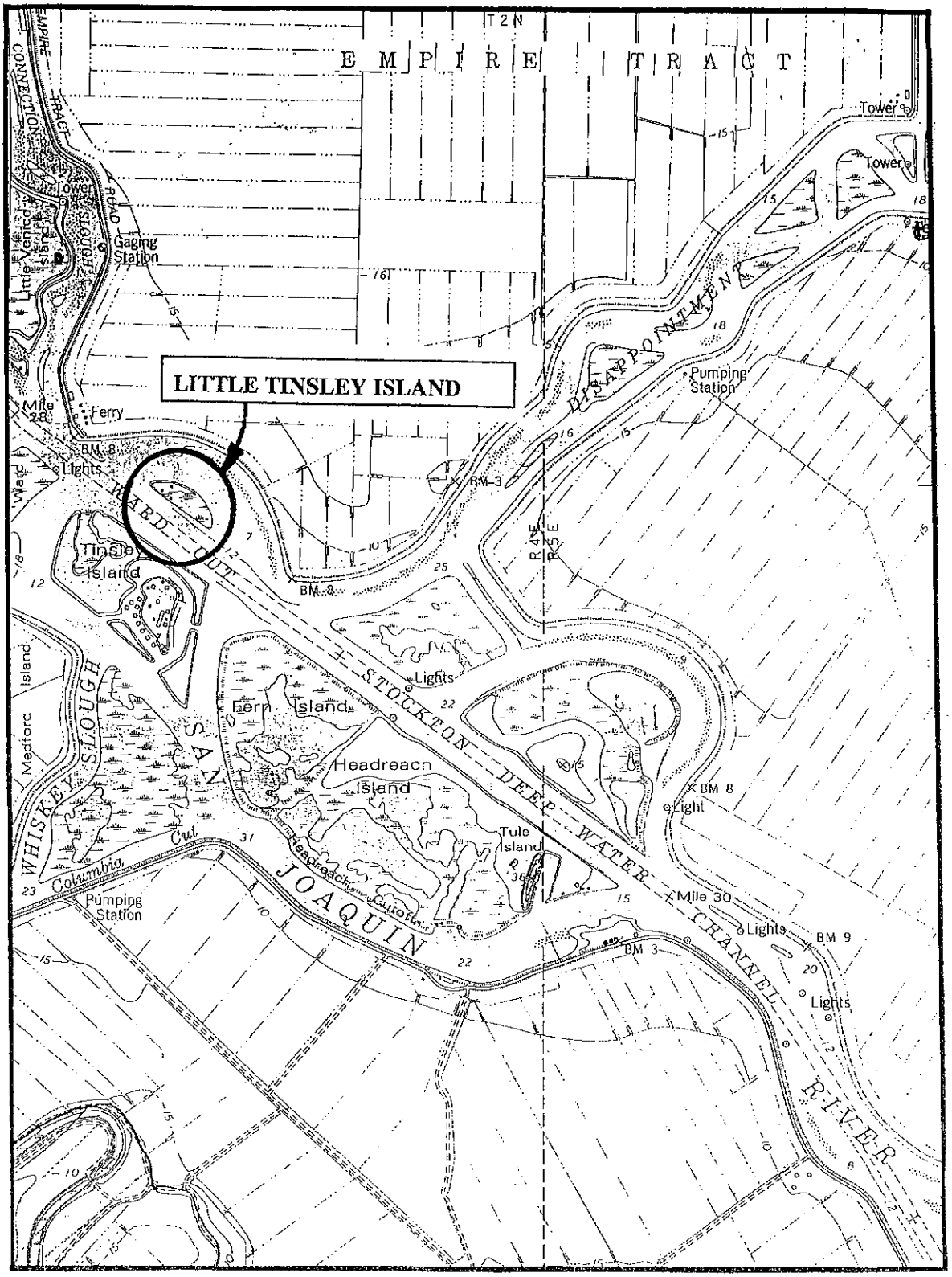
WEBB TRACT


LITTLE TINSLEY ISLAND
EMPIRE TRACT
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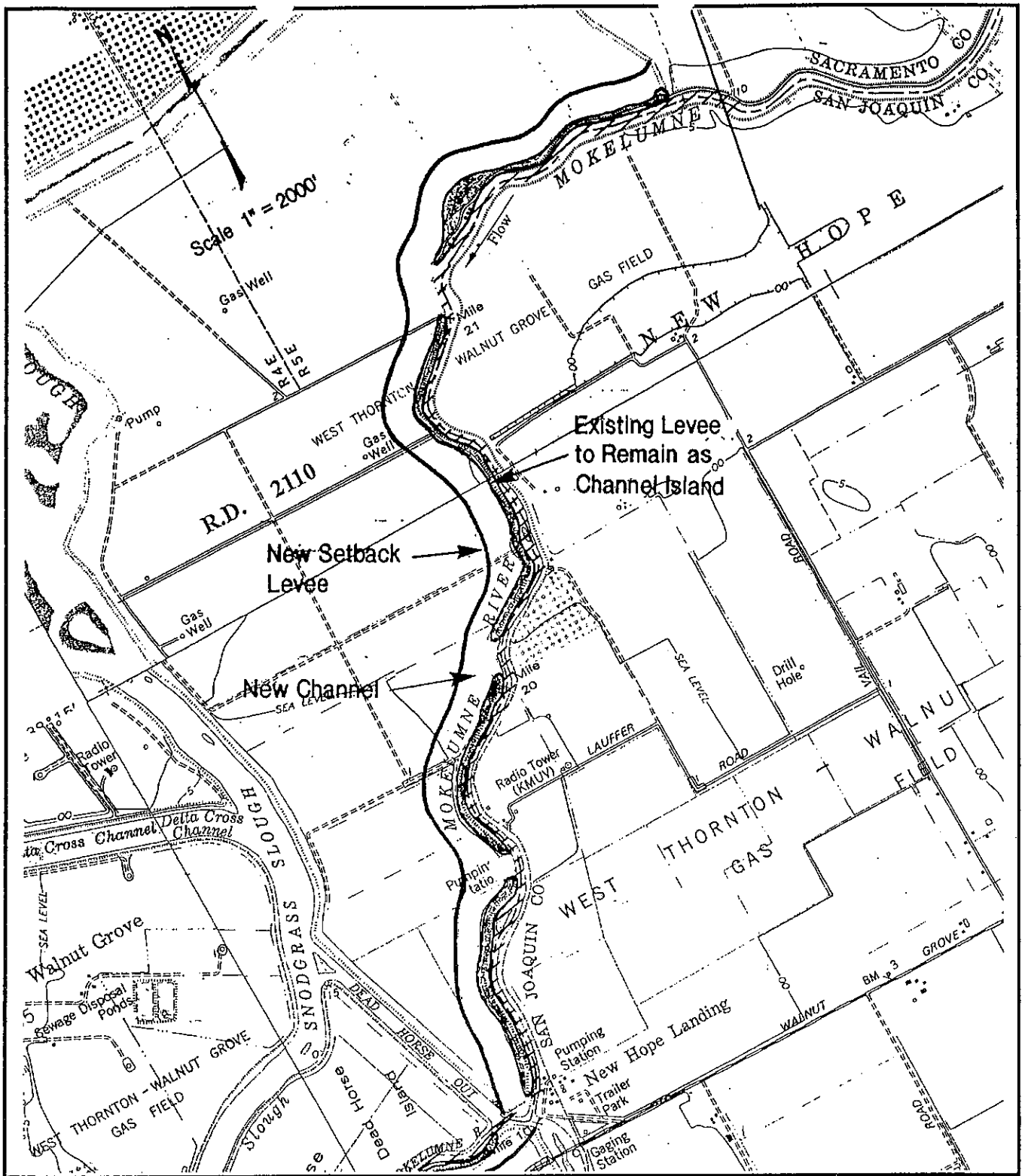
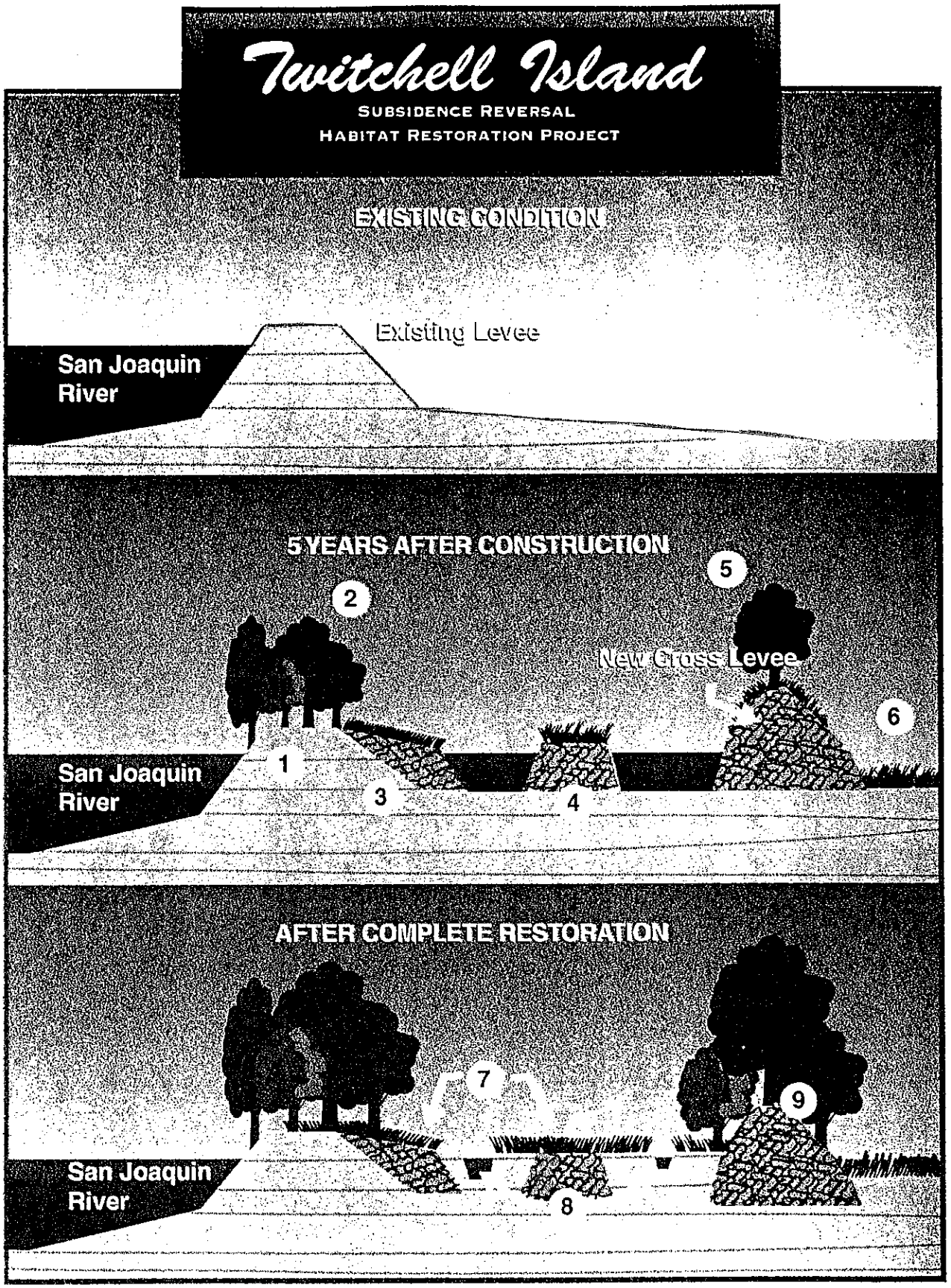
Tower
Gaging Station
Little Venice Island
Mile 28
Ferry
BM 8
Lights
WARD CUT
Tinsley Island
BM 3
BM 8
Pumping Station
DEAD POINTMENT
STOCKTON DEEP WATER CHANNEL
Lights
Fern Island
Headreach Island
Tule Island
Light
BM 8
Mile 30
Lights
BM 9
BM 3
Lights
Medford Island
WHISKEY SLOUGH
SAN JOAQUIN
RIVER
Columbia Cut
Headreach Cutoff
Pumping Station



Proposed Setback Levee Alignment McCormack-Williamson Tract Mokelumne River	APPLICANT: Reclamation District No. 2110 McCormack-Williamson Tract c/o Mr. Tom McCormack Box A Rio Vista, California 94571 Date: July 1997	**Mokelumne River Setback Levee and Habitat Enhancement Project** DATUM: NGVD COUNTY: Sacramento Figure 1

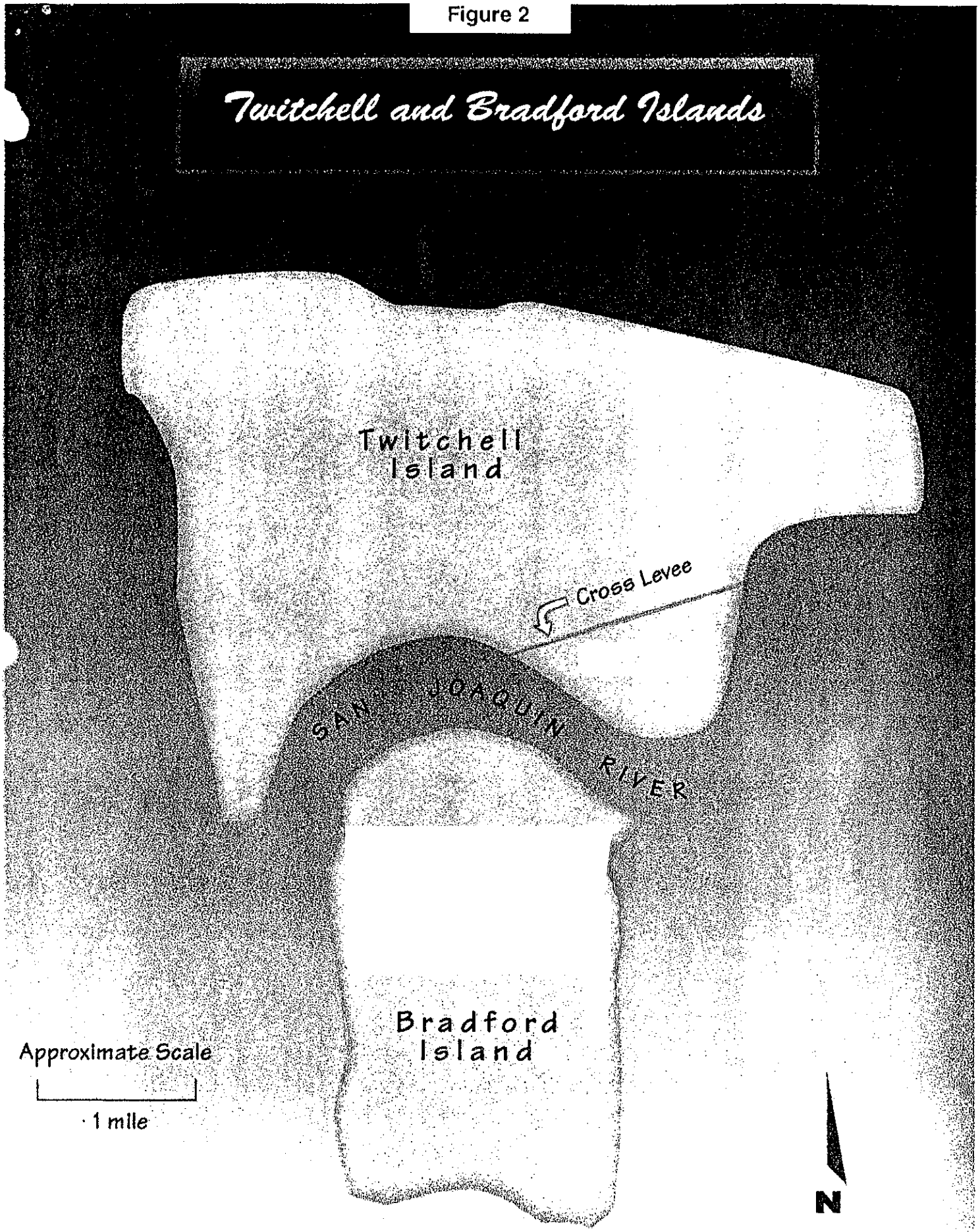
MURRAY BURNS AND KIENLEN - Consulting Civil Engineers
1616 29th Street Ste 300, Sacramento CA 95816 - (916) 456-4400

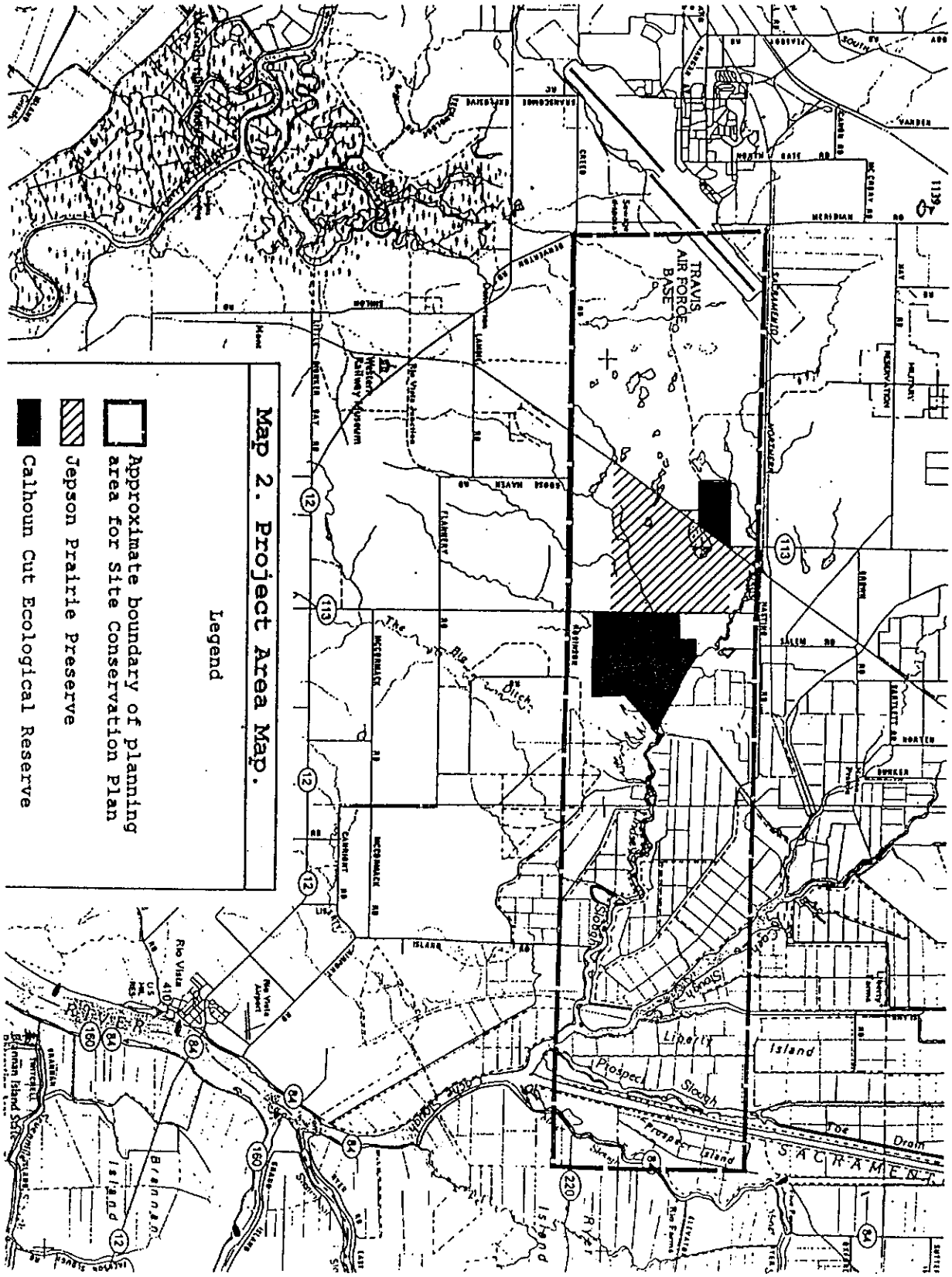
Figure 1



Reversing Subsidence: Twitchell Island

Figure 2


Twitchell and Bradford Islands
Twitchell Island
Cross Levee
SAN JOAQUIN RIVER
Bradford Island
Approximate Scale
1 mile
N



Map 2. Project Area Map.

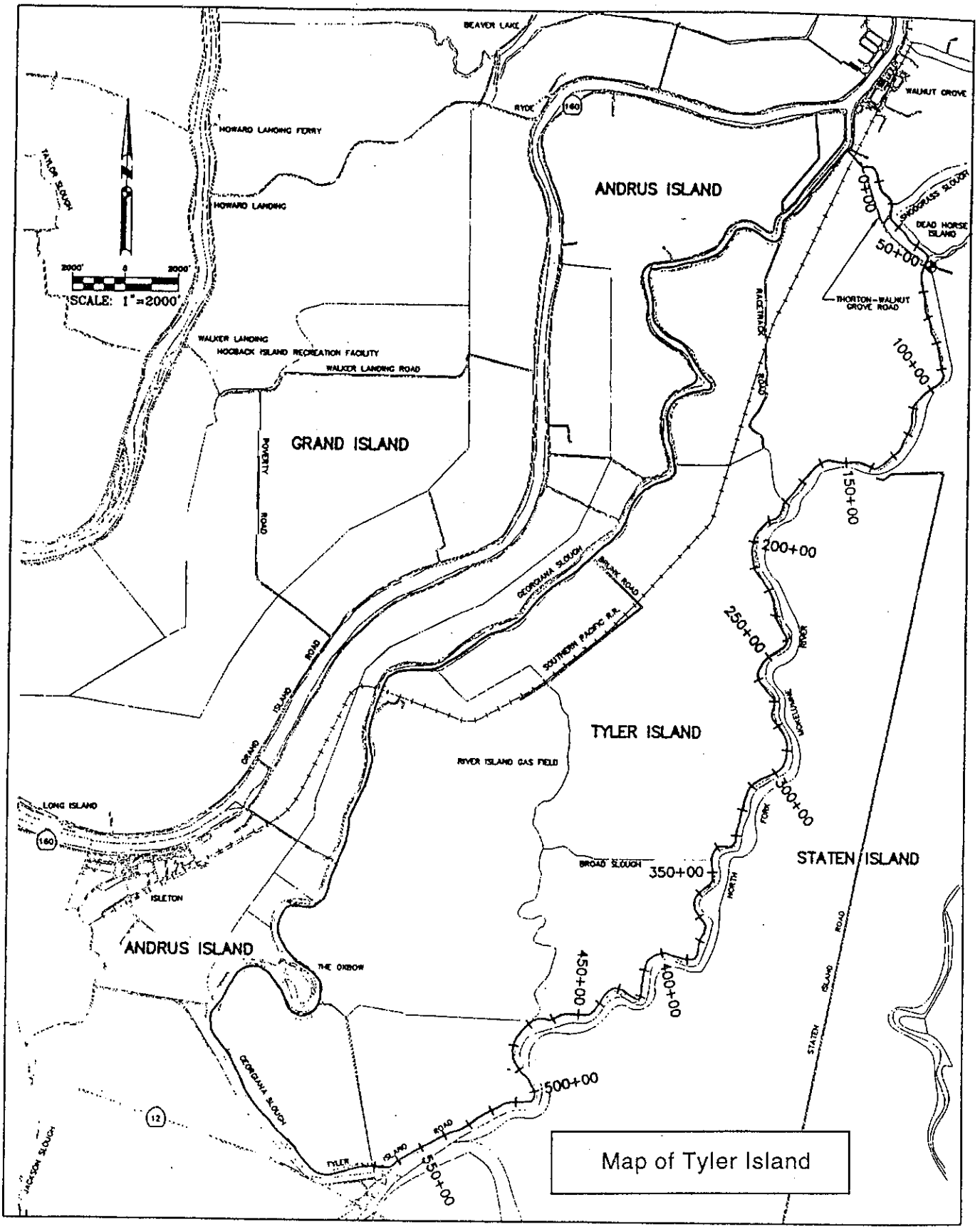
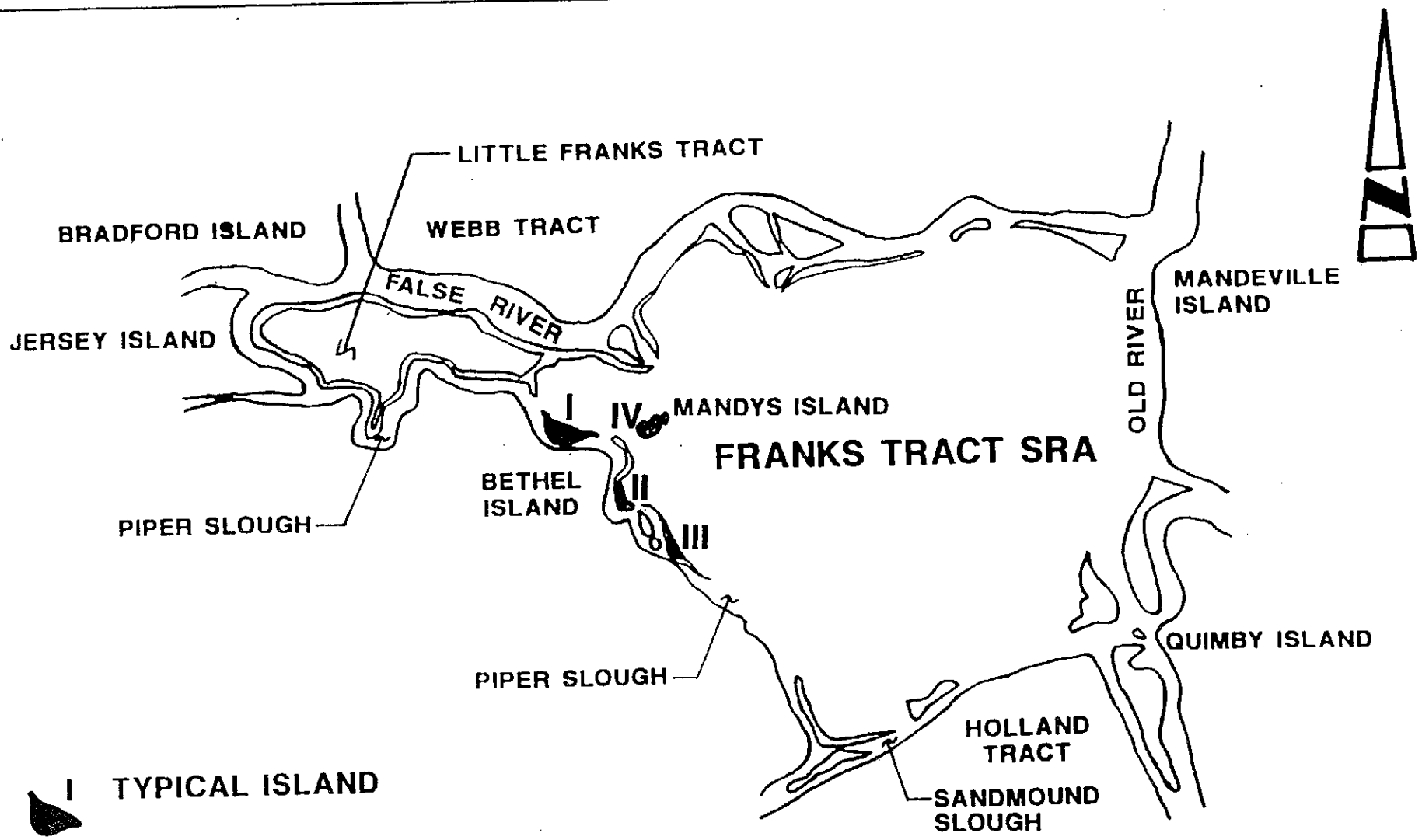

BEAVER LAKE
RYDE
160
WALNUT GROVE
HOWARD LANDING FERRY
HOWARD LANDING
TAYLOR SLOUGH
ANDRUS ISLAND
0+00
SNODGRASS SLOUGH
DEAD HORSE ISLAND
50+00
THORTON-WALNUT GROVE ROAD
RACETRACK ROAD
100+00
2000' 0 2000'
SCALE: 1"=2000'
WALKER LANDING
HOGBACK ISLAND RECREATION FACILITY
WALKER LANDING ROAD
GRAND ISLAND
POVERTY ROAD
150+00
200+00
GEORGIANA SLOUGH
BRIDGE ROAD
SOUTHERN PACIFIC R.R.
250+00
GRAND ISLAND ROAD
TYLER ISLAND
RIVER ISLAND GAS FIELD
MOKELUMNE RIVER
300+00
LONG ISLAND
160
BROAD SLOUGH
350+00
NORTH FORK
STATEN ISLAND
ISLETON
ANDRUS ISLAND
THE OXBOW
450+00
400+00
STATEN ISLAND ROAD
GEORGIANA SLOUGH
500+00
12
JACKSON SLOUGH
TYLER ISLAND ROAD
550+00
Map of Tyler Island

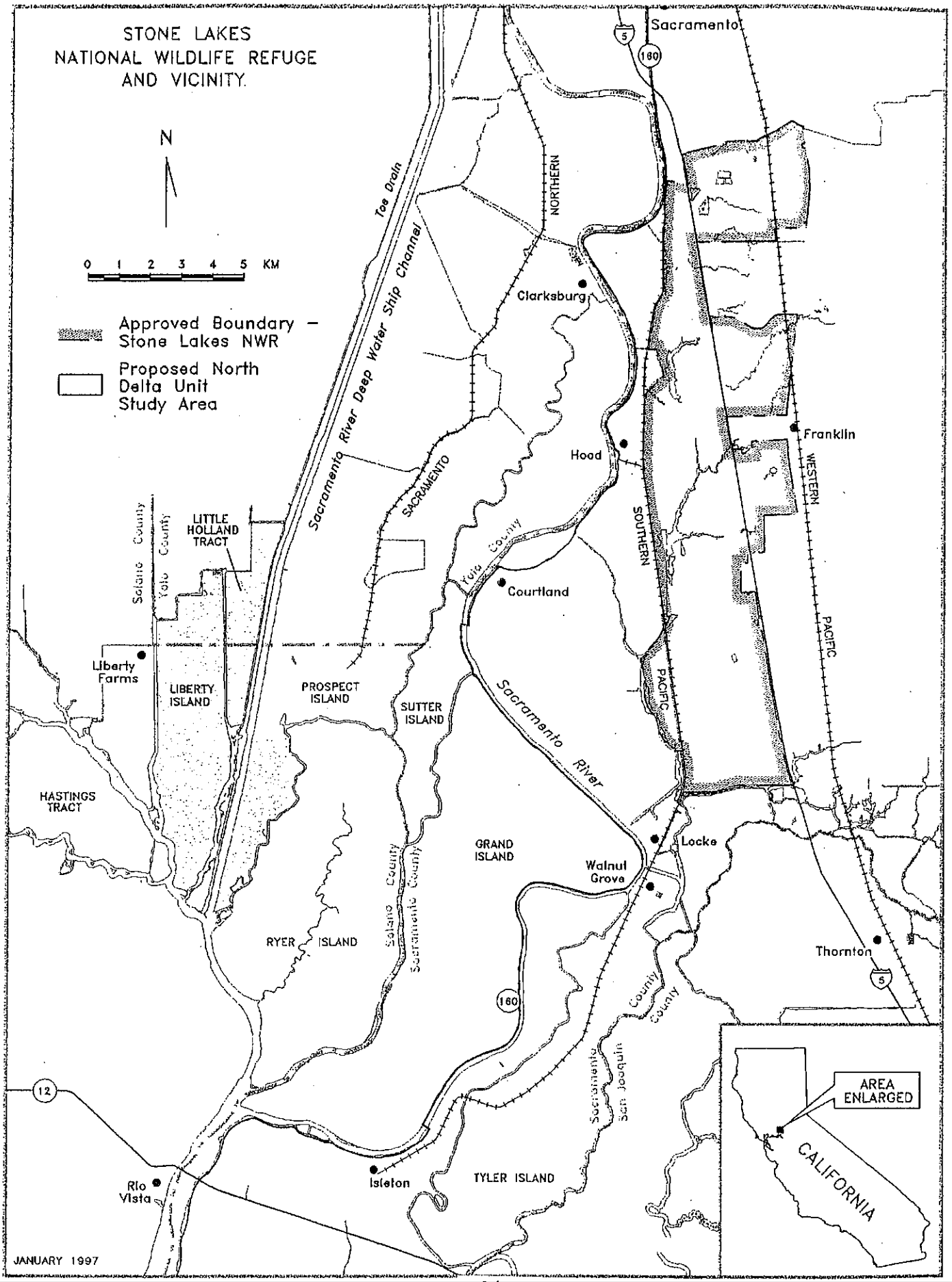
Figure 1

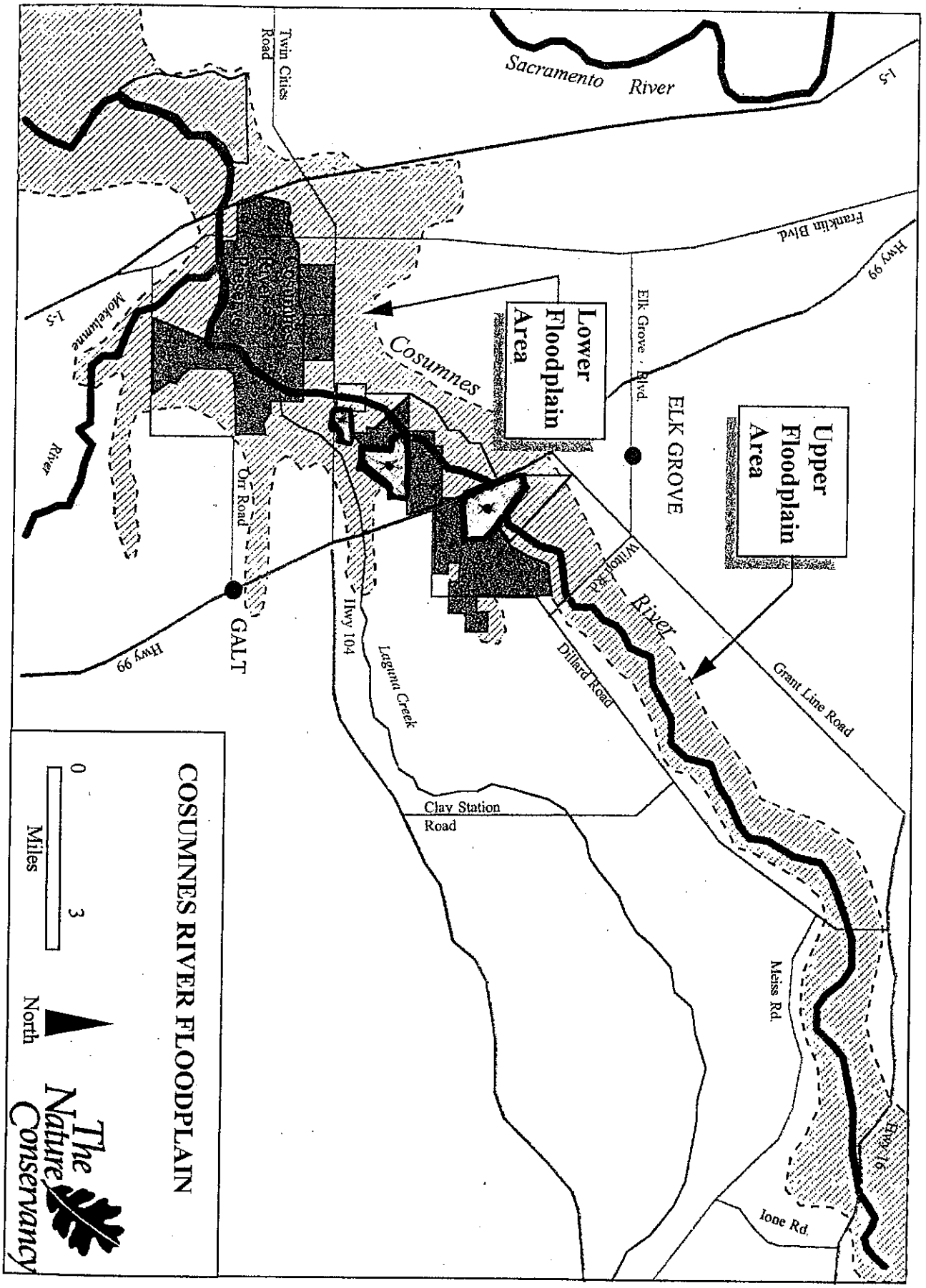


DEMONSTRATION ISLAND LOCATION

NOT TO SCALE

EXHIBIT Ic


STONE LAKES
NATIONAL WILDLIFE REFUGE
AND VICINITY
N
0 1 2 3 4 5 KM
Approved Boundary – Stone Lakes NWR
Proposed North Delta Unit Study Area
Sacramento
5
160
Toe Drain
NORTHERN
Sacramento River Deep Water Ship Channel
Clarksburg
Hood
Franklin
WESTERN
SACRAMENTO
SOUTHERN
Solano County
Yolo County
LITTLE HOLLAND TRACT
Courtland
PACIFIC
Liberty Farms
LIBERTY ISLAND
PROSPECT ISLAND
SUTTER ISLAND
Sacramento River
HASTINGS TRACT
GRAND ISLAND
Locke
Walnut Grove
RYER ISLAND
Thornton
Sacramento County
San Joaquin County
12
Rio Vista
Isleton
TYLER ISLAND
AREA ENLARGED
CALIFORNIA
JANUARY 1997


Sacramento River
I-5
Twin Cities Road
Franklin Blvd
Hwy 99
Elk Grove Blvd.
ELK GROVE
Lower Floodplain Area
Upper Floodplain Area
Cosumnes River Preserve
Cosumnes River
Mokelumne River
Orr Road
GALT
Hwy 99
Hwy 104
Laguna Creek
Dillard Road
Willow Slough
Grant Line Road
Clay Station Road
Meiss Rd.
Hwy 16
Ione Rd.
COSUMNES RIVER FLOODPLAIN
0
3
Miles
North
The Nature Conservancy